In the Claims:

The status of the claims is as follows:

1-17. (Canceled).

18. (Previously Presented) A method for encoding a thin film, comprising steps of:

etching a semiconductor or insulator substrate to form a thin film including pores;

varying etching conditions to vary porosity in the thin film according to a pattern that will generate an optical signature in the reflectivity spectrum in response to illumination, the optical signature including a grey scale code; wherein

said step of varying comprises applying an etching waveform formed by the addition of at least two separate sine components in accordance with the following equations:

$$A_n = (A_{nmax} - A_{nmin})/2 \quad (1)$$

$$k_n = \text{frequency} = 1/\text{period} \quad (2)$$

$$y_n = A_n [\sin(k_n t - \Phi) + 1] + A_{nmin} \quad (3)$$

$$y_{comp} = [y_1 + \ldots + y_n]/n \quad (4)$$

wherein Equation (1) defines the amplitude of sine component n, which results in the spectral peak height, or grey scale of a bit; Equation (2) defines the frequency of the each sine component, which results in the spectral position of a peak, or identification of a bit (1st bit, 2nd bit, etc....);. Equation (3) defines sine component n. and Equation (4) defines the composite waveform used to drive the electrochemical etch.

19. (Canceled).

20. (Original) The method of claim 18, wherein the grey scale code is revealed in naturally optically converted k-space.

21. (Original) The method according to claim 18, further comprising a step of separating the thin film from the semiconductor or insulator substrate.

22. (Previously Presented) The method according to claim 21, further comprising a

step of separating the thin film into particles.

23. (Previously Presented) The method according to claim 22, further comprising a step of placing a particle within a host.

24. (Previously Presented) The method according to claim 22, further comprising steps of:

generating an interference pattern in the reflectivity spectrum by illumination of one or more of the particles;

determining a particle's code from the position and heights of peaks in k-space.

25. (Canceled).

26. (Original) The method according to claim 18, further comprising a step of spatially defining the semiconductor or insulator substrate to conduct said step of etching in a spatially defined location or locations.

27. (Original) The method according to claim 26, wherein said step of varying further varies etching conditions in different spatially defined locations to encode multiple codes in the thin film.

28. (Original) The method according to claim 27, further comprising a step of separating the thin film from the semiconductor or insulator substrate.

29. (Original) The method according to claim 28, further comprising a step of separating the thin film into particles.

30. (Previously Presented) A method for identification of an analyte bound to an encoded particle or identification of a host including an encoded particle of claim 22, the method comprising steps of:

associating the one or more of the particles with the analyte or the host;

generating an interference pattern in the reflectivity spectrum by illumination of the

particle;

determining the particle's code from the interference pattern;

identifying the analyte or the host based upon said step of determining.

31. (Original) The method according to claim 30, further comprising a step of designating the particle to bind an analyte by modifying the particle with a specific receptor or targeting moiety.

32. (Original) The method according to claim 31, wherein the targeting moiety is a sugar or polypeptide.

33. (Original) The method according to claim 32, further comprising a step of signaling binding of an analyte by fluorescence labeling or analyte autofluorescence.

34. (Previously Presented) The method of claim 18, further comprising steps of:

applying an electropolishing current to the wafer to remove the porous film from the wafer;

dicing the film into micron-sized particles, each micron-sized particle maintaining an optical signature produced by said step of etching.

35. (Original) The method according to claim 34, further comprising a step of modifying the particles with a specific receptor or targeting moiety.

36. (Previously Presented) An encoded micron-sized particle having a grey scale code embedded in its physical structure by refractive index changes between different regions of the particle, the particle having been made by the method of claim 22.

37. (Original) The particle of claim 36, further comprising a receptor.

38. (Original) The particle of claim 37, wherein said receptor is a receptor for a biological analyte.

39. (Original) The particle of claim 37, wherein said receptor is a receptor for a chemical analyte.

40. (Original) The particle of claim 37, wherein said receptor is a receptor for a gaseous analyte.

41. (Original) The particle of claim 37, further comprising a fluorescence tag for assaying the particle.

42. (Previously Presented) An encoded micron-sized thin film having a grey scale code embedded in its physical structure by refractive index changes between different regions of the thin film, the thin film having been made by the method of claim 18.

43. (New) A method for encoding a thin film, comprising steps of:

etching a semiconductor or insulator substrate to form a thin film including pores;

adding multiple sine waveforms together in a computer memory to form a composite waveform that will be used to control etching of the semiconductor or insulator substrate, wherein the composite waveform has a pattern that will generate an optical signature in the reflectivity spectrum in response to illumination, the optical signature including a grey scale code;

varying etching conditions according to the composite waveform.